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J. A. KAVANAGH

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ELECTRICAL SWITCH

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FIG. 1.

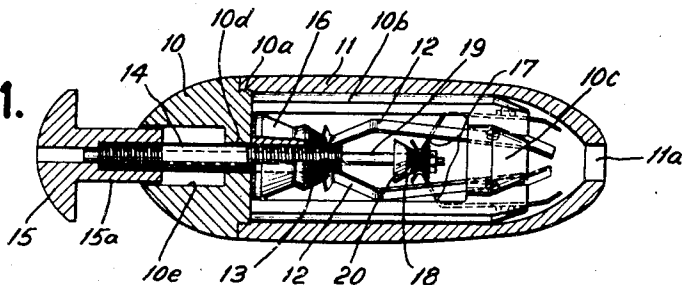


FIG. 2.

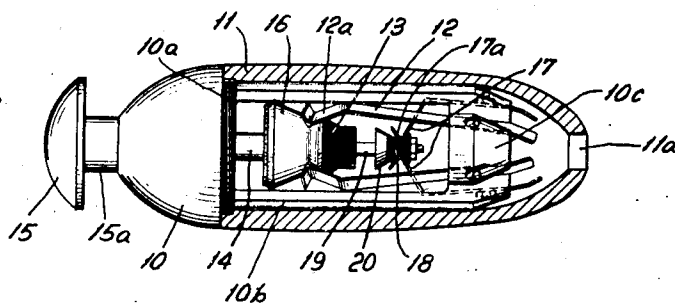


FIG. 3.

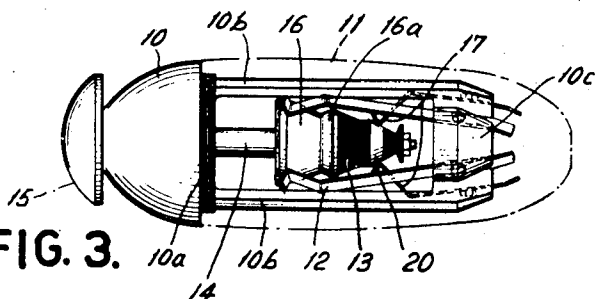


FIG. 4.

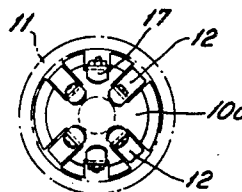
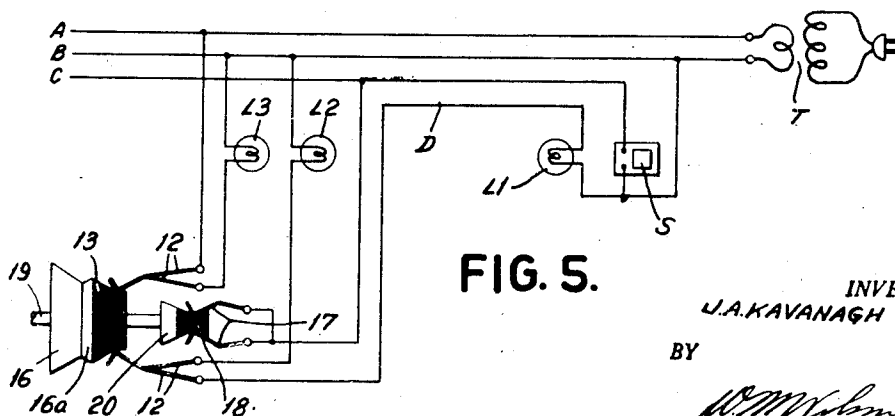


FIG. 5.



INVENTOR.
J. A. KAVANAGH

BY

W. M. Nelson

UNITED STATES PATENT OFFICE

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ELECTRICAL SWITCH

Joseph A. Kavanagh, New York, N. Y., assignor
to International Business Machines Corporation,
New York, N. Y., a corporation of New
York

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3 Claims. (Cl. 200—16)

1

This invention relates to electric switches and more particularly to that class known as a push button switch.

The primary object of the present invention is to provide an improved push button switch suitable for use in signaling systems.

An object is to provide a push button switch suitable for use in nurses' call systems and other systems employing annunciators, buzzers, and other signals, particularly signaling systems used in hospitals.

An object is to provide a push button switch which is relatively simple and easily operated.

An object is to provide a push button switch of the locking type arranged to lock in an intermediate operated position for the maintenance of a visible signal such as a light after the sounding of a momentary signal and the release of the annunciator target.

An object is to provide a push button switch which is very simple and rugged in construction so as to be capable of withstanding considerable abuse and capable of long life.

Other objects of the invention will be pointed out in the following description and claims and illustrated in the accompanying drawings, which disclose, by way of example, the principle of the invention and the best mode, which has been contemplated, of applying that principle.

In the drawings:

Fig. 1 is a longitudinal section showing the switch in normal position.

Fig. 2 is a side view partly in section showing the switch in the intermediate or locking position.

Fig. 3 is a side view with the casing removed and showing the switch in the fully operated position.

Fig. 4 is an end view of the switch as viewed from the right in Fig. 3.

Fig. 5 is a wiring diagram illustrating the application of the switch to a typical nurses' call system.

The casing for the switch is substantially bullet-shaped in outline and comprises what may be termed the base portion 10 and a cover 11 which may be screwed on a threaded shoulder 10a formed in the base 10. The cover 11 is provided with an opening 11a at its right hand end for the introduction of the extension cord which connects the switch to the bedside outlet when the switch is used in a nurses' call system. The base 10 is formed with two parallel branches 10b which extend into the interior of the casing 11 to a point a little to the left of the opening 11a

2

to which point the branches 10b are integral with a partition 10c.

This partition 10c is slotted to receive four primary contact elements 12 which are secured to the partition 10c symmetrically with respect to the longitudinal axis of the switch as a whole. These contact elements 12 extend to the left (Fig. 1) and are bent at 12a to act as switch contact fingers normally cooperating with an insulating bushing 13. This bushing is screwed on the end of a metallic tube 14 received in a longitudinal bore 10d in the base 10. Also secured on the left-hand end of the tube 14 is the switch actuating finger-piece or push-button 15 which has a reduced cylindrical portion or shank 15a sliding in the bore 10e which is concentric with the bore 10d and the tube 14. Also secured on the tube 14 tight against the bushing 13 is a metallic contact element 16. The bushing 13 and the contact element 16 thus are pushed to the right (Fig. 1) whenever the push-button 15 is similarly operated.

The base 10 and the cover 11 preferably are formed of a suitable insulating material such as molded plastic and is shaped so that the switch may be easily held in the palm of the hand and the button 15 pressed with the thumb. The bushing 13 is roughly shaped like the frustum of a cone whereby, when the button 15 is actuated all the way to the right as described, the contact elements 12 will be spread apart and ride up upon the surface of the contact element 16 as shown in Fig. 3. In this position all of the contact elements 12 will be electrically connected together by the contact element 16. Normally the bent ends of the contact element 12 press against the conical surface of the bushing 13 and thereby tend to cam said button and the contact 16 to the left, thus normally holding the contact 16 and the push-button 15 in the position of Fig. 1.

The contact element 16 also is shaped like a frustum of a cone but its smaller base is somewhat enlarged at 16a, the enlargement being formed as a conical surface which, with the larger conical surface, forms a shallow groove. In other words, the contact member 16 is shaped roughly like an hour glass with one of the sections of shorter length than the other. When the push-button 15 is operated to push the contact member to the position of Fig. 3 and released, the bent ends 12a, by pressing inwardly toward the longitudinal axis of the switch, causes the restoration of the button 15 which continues until the bent portions 12a strike the enlarged portion 16a and retain the contact

member 16 and the finger piece 15 in the position of Fig. 2. In other words, when the push-button 15 is pressed to the right to operate the switch, the bent portions 12a first ride up the conical surface of the insulating bushing 13 and snap behind the enlargement 16a and then continue to ride up the conical surface of the contact 16 to the position of Fig. 3. While the push-button 15 is in this position, the spring pressure of the contact elements 12 tends to move the push-button 15 and the contacts 16 to the left and, if the push-button is released slowly or not too quickly, the push-button will be merely restored to the extent shown in Fig. 2 and will remain in that position. Thus, the push-button may be locked in an intermediate position in which it will remain until released holding circuits through contacts 12 and 16.

Release of the switch may be effected either by again pressing the button 15 to the right and releasing it quickly, as by flicking the button 15 with a finger, or the button may be positively pulled to the left from the position of Fig. 2 with the fingers.

Mounted in slots in the plug 10c on diametrically opposite sides of the longitudinal axis of the switch, between the slots for contacts 12, are two additional secondary contact members 17 which extend inwardly and are formed with bent portions 17a similar to the portions 12a. These bent portions 17a engage diametrically opposite sides of an insulating bushing 18 secured on the end of a rod 19 which is loosely mounted in the bore of the tube 14. The bushing 18 is shaped approximately like an hour glass and is mounted alongside of a contact 20 shaped like a frustum of a cone and secured on the rod 19, means such as a nut being provided to clamp the bushing 18 and the contact 20 together on the rod. The contact elements 17 thus coact with the assembly comprising bushing 18 and contact 20 in the same general way as the contact elements 12 cooperate with bushing 13 and contact 16, except that in this case there is no intermediate enlargement like 16a and the conical surface of the contact 20 merges smoothly with the surface of the bushing 18.

When the button 15 is pressed to the right to the position of Fig. 3, the bent portions 17a of contacts 17 ride up on the conical surface of the contact 20 and electrically connect the contact elements 17. Inasmuch as the sleeve 14, the contact 16, rod 19, and contact 20 are metal and in contact with each other the effect of pushing the button 15 to the right as described is to electrically connect together all of the contact elements 12 and 17. When the pressure on the button 15 is released and the switch permitted to lock in the position of Fig. 2, the circuit through the contact elements 17 is broken owing to the fact that as the button 15 moves to the left from the position of Fig. 3, the pressure of the contact elements 17 first causes the rod 19 and contact 20 to follow the bushing 13 to the left until the bent portions 17a reengage the bushing 18. With continued movement of the push-button 15 and parts connected thereto, to the left to the position of Fig. 2, the assembly including the bushing 13, rod 19, and contact 20 is held by members 17 in the position of Fig. 2.

The application of the push button switch to a typical signaling circuit may be illustrated in Fig. 5 which shows the elements of a nurses' call system suitable for use in either the private rooms

or the wards of a hospital. In Fig. 5 the line wires of the signal system are designated A, B, C, of which wires A and B are the main current supply wires from a low voltage transformer T. The third wire C may be the buzzer common for the annunciator board. In the present case, it is assumed that the board contains a light designated L in Fig. 5 for every bed or private room whereas S designates the buzzer which is common to all of the lights on the board. L2 may be a light located over or adjacent the door to a private room to indicate to a nurse passing through the corridor that the patient needs attention. L3 may be used in wards where there may be provided a signal lamp for each bed or patient to notify the nurse which patient signaled for attention.

When the push-button 15 is pushed to the right as far as it will go, as in Fig. 3, four circuits are established simultaneously through the lights L1, L2, L3 and the buzzer S as follows: Line wire A, one of the contact elements 12, the contact 16, rod 19, contact 20, a contact 17, wire C, and buzzer S, to the other line wire B. This draws the attention of the nurse to the call board if absent from the board but near enough to hear the buzzer signal. As soon as the push-button 15 is released and the switch permitted to assume the position shown in Fig. 2, the circuit to buzzer S is interrupted. A second circuit is established through the call light L1 on the board from the line wire A, a contact 12, contact 16, another contact 12, and lamp L1, to the line wire B. When the push-button switch is released and locks in the position of Fig. 2, the lamp L1 remains lighted and indicates on the call board the room or bed needing attention. In similar fashion the lights L2 and L3 are lighted and remain lighted as long as the switch remains in the position of Fig. 2.

It is thus possible for the nurse to tell immediately, whether she is at the desk or making rounds to patients, who requires attention and, as each patient is attended the nurse will restore the push-button switch in the manner disclosed above before leaving the patient.

It will be understood that there may be as many push-button switches as there are beds or private rooms and the connections for all the switches to the wires A, B, and C will be the same but there will be an individual wire D from each push-button station to a lamp on the call board. In the case of private rooms with a single bed the lamp L3 may be dispensed with as it serves no useful purpose at the bedside. When the signal S is restored in a ward, only one light L1 is necessary at the nurse's desk in which case all of the push-button switches will be connected in common to the wire D and the lamp L2 may be dispensed with. It will be seen that the push-button switch is adaptable to a variety of purposes in a call system.

One of the main effects of the push button switch described herein is that the wear on the contact elements is more even and better contact is obtained by reason of the wiping action resulting when the button 15 is pressed and also arising from the fact that the contact elements 16 and 20 are free to rotate. In the use of the switch, the button 15 naturally will be rotated slightly from time to time thus causing different parts of the surface of the contacts 16 and 20 to rotate more or less. On account of the symmetrical arrangement and number of contact elements 12 and 17, the contact

elements 18 and 20 are automatically centered thereby simplifying their mounting. It is thus possible for a great deal of wear to take place in the switch elements before there is likelihood that it will fail to function properly. Thus the moving parts of the switch do not have to be made with great precision thereby reducing the cost of manufacture considerably. This arises from the fact that the moving parts are self-centering making it unnecessary to provide close tolerances in the moving parts or their mounting.

While there have been shown and described and pointed out the fundamental novel features of the invention, as applied to a preferred embodiment, it will be understood that various omissions and substitutions and changes in the form and details of the device illustrated and in its operation may be made by those skilled in the art without departing from the spirit of the invention. It is the intention therefore to be limited only as indicated by the scope of the following claims.

What is claimed is:

1. An electric switch comprising a contact element having a shape like an hour glass and an insulating bushing secured in axial alignment therewith and having a shape like a frustum of a cone with its larger diameter the same as the diameter of the adjacent base of the contact element, a plurality of contact fingers symmetrically disposed about the axis of said insulating bushing and said contact member and normally coacting with the side of said insulating bushing to maintain the contact in open circuit position, said insulating bushing and contact element being movable in the direction of their axis to carry said contact fingers into engagement with said contact and by coaction with the narrowest part of the contact element maintaining said contact in a closed circuit position with said contact members, said contact and insulating bushing having an overtravel greater than necessary to establish electrical contact between said finger and said contact and a second contact means closed when said first contact overtravels and opening when said contact moves to locking position, said contact finger acting on said contact to move said contacts to the locking position

and a finger piece for actuating said first named contact to the overtravel position.

2. An electric switch comprising a contact member shaped like a cone and having a locking ridge disposed peripherally of one base of said cone, said contact member being movable along the axis of symmetry of said cone from an open circuit position to a first closed circuit position past an intermediate closed circuit position; a plurality of primary contact elements disposed symmetrically about said axis and engageable by said contact member in said intermediate position, said ridge engaging said elements in the intermediate position to hold said contact member in the intermediate position; a second conical contact member having a lost motion movement with said first contact member, and secondary contact elements symmetrically disposed to be engaged by said second member when said first member is in the first closed circuit position.

3. An electrical switch comprising two groups of control elements symmetrically disposed about an axis, one group of primary contact elements being spaced along said axis from the other group of secondary contact elements; and two contact members aligned on said axis, one for each group of contact elements, the contact members being movable from an open circuit position past an intermediate closed circuit position in which one of said contact members engages the primary contact elements to a terminal closed circuit position in which the other contact member engages the secondary contact elements, said first one of said members being shaped to coact with the primary contact elements to hold said one contact member in the intermediate closed circuit position when the contact members are restored from said terminal closed position.

JOSEPH A. KAVANAGH.

REFERENCES CITED

The following references are of record in the file of this patent:

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Number	Country	Date
755,222	France	May 6, 1933